

Countermeasures to Neurobehavioral Deficits from Cumulative Sleep Deprivation During Space Flight: Dose-Response Effects of Recovery Sleep Opportunities

Completed Technology Project (2004 - 2008)



Project Introduction

Data collection is now complete. Seventy-two subjects completed the 16 day in-laboratory study protocol (for a total of 1152 laboratory days). We are currently in the process of performing analyses on the data collected. Specifically, we are analyzing the neurobehavioral performance changes across the experimental protocol, and the recovery phase. We are in the process of manual scoring and analysis of the polysomnographic and cardiovascular data. Preliminary data suggests that a single sleep period of 8h, 10h or 12h after 5 nights of 4h sleep, provides substantial acute recovery, but not protection against the immediate reappearance of performance deficits when it is followed by 5 additional nights of sleep restriction.

Anticipated Benefits

The primary aim is to determine the sleep dose-response effects of an acute change in sleep duration that occurs between two periods of chronic sleep restriction, on neurocognitive performance functions, subjective states, and waking and sleep physiology. The experiment will determine the countermeasure benefits for performance (during critical operations and subsequent days of sleep restriction) from an acute increase in sleep duration (i.e., single night of recovery sleep). The knowledge gained has the potential to change work scheduling and further understand the effect of sleep loss and recovery on neurobehavioral function in many Earth-based safety-sensitive occupations, such as transportation workers (e.g., truck drivers, train conductors, airline pilots); operators in safety-sensitive industries (e.g., power plant control rooms); and military personnel.



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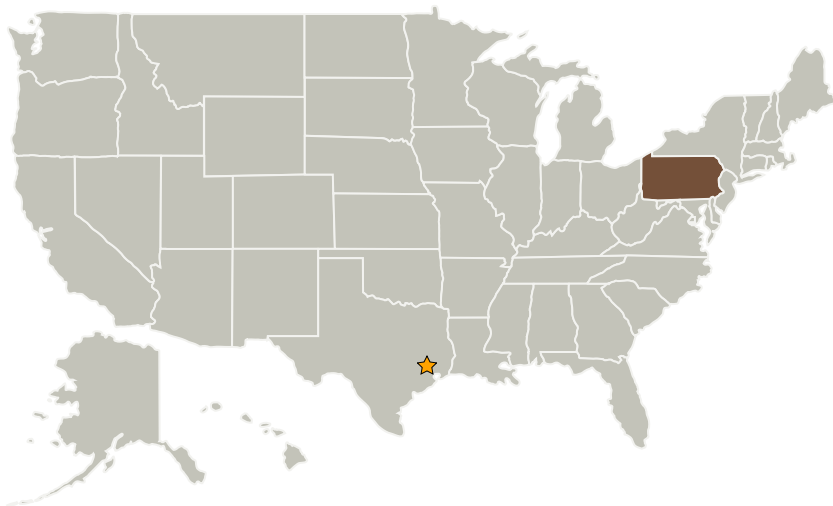
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
University of Pennsylvania	Supporting Organization	Academia	Philadelphia, Pennsylvania
University of Pennsylvania Health System	Supporting Organization	Academia	Pennsylvania

Primary U.S. Work Locations

Pennsylvania

Project Transitions

▶ **June 2004:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Principal Investigator:

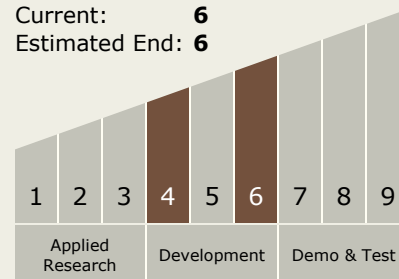
David F Dinges

Co-Investigator:

Siobhan Banks

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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✓ May 2008: Closed out

Closeout Summary: Data collection is now complete. Seventy-two subjects completed the 16 day in-laboratory study protocol (for a total of 1152 laboratory days). We are currently in the process of performing analyses on the data collected. Specifically, we are analyzing the neurobehavioral performance changes across the experimental protocol, and the recovery phase. We are in the process of manual scoring and analysis of the polysomnographic and cardiovascular data. Preliminary data suggests that a single sleep period of 8h, 10h or 12h after 5 nights of 4h sleep, provides substantial acute recovery, but not protection against the immediate reappearance of performance deficits when it is followed by 5 additional nights of sleep restriction.

Stories

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/8375>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25820>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25781>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25796>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/8367>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/8368>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/24975>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25545>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25456>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/26124>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25011>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25391>)

Technology Areas

Primary:

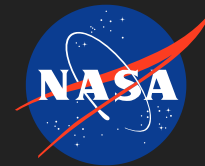
- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.3 Behavioral Health and Performance

Target Destinations

The Moon, Mars

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(<https://techport.nasa.gov/file/25248>)

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Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25511>)

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25656>)

Abstracts for Journals and Proceedings
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Abstracts for Journals and Proceedings
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Abstracts for Journals and Proceedings
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Abstracts for Journals and Proceedings
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Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/25557>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/26090>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/26183>)

Articles in Peer-reviewed Journals
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Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/25995>)

Articles in Peer-reviewed Journals
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Awards
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Awards
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Awards

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Books/Book Chapters

(<https://techport.nasa.gov/file/25727>)

Books/Book Chapters

(<https://techport.nasa.gov/file/25457>)

Project Website:

<https://taskbook.nasaprs.com>